

SUPPLEMENTARY TABLES

Supplementary Table 1. Clinicopathological characteristics of all included HCC patients stratified by sex.

Features	Male (n=780)	Female (n=390)	P-value
Age (mean, Years)	53.87(10.17)	54.25(11.04)	0.555
Cigarette smoking (Yes/No)(%)	151(19.4)/629(80.6)	8(2.1)/382(97.9)	<0.001
Alcohol consumption (Yes/No)(%)	244(31.3)/536(68.7)	8(2.1)/382(97.9)	<0.001
Diabetes mellitus (Yes/No)(%)	169(21.7)/611(78.3)	47(12.1)/343(87.9)	<0.001
Antiviral (Yes/No)(%)	164(21.0)/616(79.0)	76(19.5)/314(80.5)	0.591
Tbi(mean, μ mol/L)	14.51(9.78)	14.51(24.13)	0.999
Alb(mean, g/L)	41.25(3.92)	41.49(4.23)	0.335
ALT(mean, U/L)	36.74(28.83)	34.74 (33.54)	0.291
AST(mean, U/L)	36.71(28.37)	40.27(31.11)	0.051
GGT(mean, U/L)	82.28(83.56)	60.27(69.64)	<0.001
ALP(mean, U/L)	90.90(45.83)	96.48(49.88)	0.057
AFP(mean, ng/ml)	471.09(1973.27)	518.95(1039.32)	0.654
HBsAg(Positive/Negative)(%)	695(89.1)/85(10.9)	340(87.2)/50 (12.8)	0.382
HBV_DNA(\geq 2000/ $<$ 2000 IU/ml)(%)	370(47.4)/410(52.6)	178(45.6)/212 (54.4)	0.605
Type of resection (Nonanatomical/anatomical)(%)	413(52.9)/367 (47.1)	200(51.3)/190 (48.7)	0.634
Surgical margin ($<$ 1/ \geq 1cm)(%)	346(44.4)/434(55.6)	164(42.1)/226 (57.9)	0.492
Hilar clamping time (mean, minutes)	15.38(8.54)	14.40(9.35)	0.071
Tumor size(mean, cm)	5.06(3.40)	4.76(3.28)	0.139
Tumor Number ($>$ 1/1)(%)	77(9.9)/703 (90.1)	25(6.4)/365(93.6)	0.062
Satellite nodules (presence/absence)(%)	96(12.3)/684 (87.7)	44(11.3)/346 (88.7)	0.679
Cirrhosis(Yes/No)(%)	499(64.0)/281(36.0)	253(64.9)/137(35.1)	0.812
Edmondson-Steiner grade III-IV/I-II(%)	525(67.3)/255(32.7)	257(65.9) /133(34.1)	0.677
MVI (Yes/No)(%)	87(11.2)/693(88.8)	60(15.4)/330(84.6)	0.049
BCLC stage (A-B/0)(%)	754(96.7)/26(3.3)	374(95.9)/16(4.1)	0.617

Bold values indicate statistical significance ($P < 0.05$). P values male versus female cohort.

HCC, hepatocellular carcinoma; Tbi, total bilirubin; Alb, albumin; ALT, alanine transaminase; AST, aspartate aminotransferase; GGT, γ -glutamyl transferase; ALP, alkaline phosphatase; AFP indicates α -fetoprotein; MVI, microvascular invasion; BCLC, Barcelona Clinic Liver Cancer.

Supplementary Table 2. Univariate and multivariate analysis of OS and RFS in all HCC patients.

Features	OS			RFS		
	HR	95%CI	P-value	HR	95%CI	P-value
Univariate analysis						
Sex(Male/Female)	0.750	0.61-0.93	0.007	0.800	0.68-0.95	0.010
Age (mean, Years)	1.000	0.99-1.01	0.455	1.000	0.99-1.01	0.727
Cigarette smoking (Yes/No)(%)	1.170	0.91-1.51	0.216	1.040	0.84-1.3	0.699
Alcohol consumption (Yes/No)(%)	1.040	0.84-1.3	0.725	1.010	0.84-1.22	0.921
Diabetes mellitus (Yes/No)(%)	0.950	0.75-1.21	0.694	1.150	0.95-1.4	0.161
Antiviral (Yes/No)(%)	0.800	0.63-1.02	0.072	0.820	0.67-1.01	0.057
Tbi(mean, μ mol/L)	1.010	1-1.01	<0.001	1.000	0.99-1.01	0.921
Alb(mean, g/L)	0.950	0.93-0.97	<0.001	0.950	0.94-0.97	<0.001
ALT(mean, U/L)	1.000	1-1.01	0.030	1.000	1-1.00	0.063
AST(mean, U/L)	1.000	1-1.01	<0.001	1.000	1-1.01	<0.001
GGT(mean, U/L)	1.000	1-1.00	<0.001	1.000	1-1.00	<0.001
ALP(mean, U/L)	1.010	1-1.01	<0.001	1.000	1-1.01	<0.001
AFP(mean, ng/ml)	1.000	1-1.00	0.001	1.000	1-1.00	0.165
HBsAg(Positive/Negative)(%)	0.980	0.74-1.3	0.886	1.160	0.91-1.49	0.234
HBV_DNA(\geq 2000/ $<$ 2000 IU/ml)(%)	1.340	1.11-1.61	0.002	1.360	1.16-1.58	<0.001
Type of resection (Nonanatomical/anatomical)(%)	1.230	1.02-1.48	0.029	1.080	0.93-1.26	0.330
Surgical margin ($<$ 1/ \geq 1cm)(%)	1.020	0.84-1.22	0.870	1.090	0.94-1.27	0.266
Hilar clamping time (mean, minutes)	1.010	1-1.02	0.181	1.010	1-1.02	0.014
Tumor size(mean, cm)	1.110	1.09-1.14	<0.001	1.090	1.07-1.11	<0.001
Tumor Number ($>$ 1/1)(%)	1.530	1.14-2.06	0.004	1.660	1.29-2.14	<0.001
Satellite nodules (presence/absence)(%)	1.930	1.5-2.49	<0.001	1.970	1.58-2.46	<0.001
Cirrhosis(Yes/No)(%)	1.380	1.13-1.68	0.002	1.280	1.09-1.51	0.003
Edmondson-Steiner grade III-IV/I-II(%)	2.550	2.04-3.19	<0.001	1.660	1.4-1.96	<0.001
MVI (Yes/No)(%)	2.040	1.6-2.6	<0.001	1.790	1.44-2.22	<0.001
Multivariate analysis						
Sex(Male/Female)				0.810	0.68-0.96	0.016
HBV_DNA(\geq 2000/ $<$ 2000 IU/ml)(%)				1.220	1.04-1.44	0.013
Tumor size(mean, cm)	1.090	1.06-1.12	<0.001	1.070	1.04-1.09	<0.001
Satellite nodules (presence/absence)(%)	2.230	1.36-3.67	0.002	2.260	1.47-3.48	<0.001
Cirrhosis(Yes/No)(%)	1.400	1.13-1.72	0.002	1.260	1.07-1.5	0.007
Edmondson-Steiner grade III-IV/I-II(%)	2.330	1.86-2.93	<0.001	1.550	1.3-1.84	<0.001
MVI (Yes/No)(%)	1.500	1.12-2.01	0.006	1.380	1.08-1.76	0.009

Bold values indicate statistical significance ($P < 0.05$).

HCC, hepatocellular carcinoma; Tbi, total bilirubin; Alb, albumin; ALT, alanine transaminase; AST, aspartate aminotransferase; GGT, γ -glutamyl transferase; ALP, alkaline phosphatase; AFP indicates α -fetoprotein; MVI, microvascular invasion; BCLC, Barcelona Clinic Liver Cancer; OS, overall survival; RFS, recurrence-free survival; CI, confidence interval; HR, hazard ratio.

Supplementary Table 3. Comparison of clinicopathological characteristics between postmenopausal females and their matched male patients.

Features	Male (n=442)	Female (n=221)	P-value
Age (mean, Years)	61.09(5.55)	62.09 (5.81)	0.032
Cigarette smoking (Yes/No)(%)	47(10.6)/395(89.4)	4(1.8)/217(98.2)	<0.001
Alcohol consumption (Yes/No)(%)	120 (27.1)/322 (72.9)	6(2.7)/215 (97.3)	<0.001
Diabetes mellitus (Yes/No)(%)	156(35.3)/286(64.7)	31(14.0)/190(86.0)	<0.001
Antiviral (Yes/No)(%)	84(19.0)/358 (81.0)	43(19.5)/178 (80.5)	0.972
Tbi(mean, μ mol/L)	15.33(10.35)	15.77(31.67)	0.789
Alb(mean, g/L)	41.11(3.92)	41.22(4.33)	0.757
ALT(mean, U/L)	34.07(23.63)	33.08(23.44)	0.609
AST(mean, U/L)	35.96(30.03)	39.89(24.29)	0.092
GGT(mean, U/L)	79.58(83.38)	51.23(40.54)	<0.001
ALP(mean, U/L)	91.75(48.34)	100.30(42.44)	0.026
AFP(mean, ng/ml)	427.58(2199.92)	427.67 (947.55)	1.000
HBsAg(Positive/Negative)(%)	384(86.9)/58(13.1)	187(84.6)/34(15.4)	0.500
HBV_DNA(\geq 2000/ $<$ 2000 IU/ml)(%)	212(48.0)/230(52.0)	98(44.3)/123 (55.7)	0.425
Type of resection (Nonanatomical/anatomical)(%)	237(53.6)/205(46.4)	111(50.2)/110 (49.8)	0.458
Surgical margin ($<$ 1/ \geq 1cm)(%)	206(46.6)/236(53.4)	89(40.3)/132(59.7)	0.143
Hilar clamping time (mean, minites)	14.66(7.89)	13.34(7.49)	0.040
Tumor size(mean, cm)	4.77(3.06)	4.33(2.51)	0.066
Tumor Number ($>$ 1/1)(%)	50(11.3)/392(88.7)	15(6.8)/206(93.2)	0.088
Satellite nodules (presence/absence)(%)	50(11.3)/392(88.7)	15(6.8)/206(93.2)	0.088
Cirrhosis(Yes/No)(%)	270(61.1)/172(38.9)	155(70.1)/66(29.9)	0.028
Edmondson-Steiner grade III-IV/I-II(%)	284(64.3)/158(35.7)	154(69.7)/67 (30.3)	0.192
MVI (Yes/No)(%)	40(9.0)/402(91.0)	32(14.5)/189 (85.5)	0.047
BCLC stage (A-B/0)(%)	429(97.1)/13(2.9)	215(97.3)/6(2.7)	1.000

Bold values indicate statistical significance ($P < 0.05$). P values male versus female cohort.

HCC, hepatocellular carcinoma; Tbi, total bilirubin; Alb, albumin; ALT, alanine transaminase; AST, aspartate aminotransferase; GGT, γ -glutamyl transferase; ALP, alkaline phosphatase; AFP indicates α -fetoprotein; MVI, microvascular invasion; BCLC, Barcelona Clinic Liver Cancer.

Supplementary Table 4. Univariate and multivariate analysis of OS and RFS in the postmenopausal group matched with male HCC patients after PSM.

Features	OS			RFS		
	HR	95%CI	P-value	HR	95%CI	P-value
Univariate analysis						
Sex(Male/Female)	0.830	0.63-1.08	0.155	0.890	0.72-1.1	0.266
Age (mean, Years)	1.010	0.99-1.03	0.484	0.980	0.97-1	0.094
Cigarette smoking (Yes/No)(%)	1.040	0.67-1.63	0.861	1.140	0.8-1.63	0.481
Alcohol consumption (Yes/No)(%)	0.790	0.57-1.1	0.164	0.860	0.66-1.12	0.262
Diabetes mellitus (Yes/No)(%)	1.040	0.8-1.37	0.760	1.100	0.88-1.37	0.421
Antiviral (Yes/No)(%)	0.720	0.51-1.02	0.066	0.900	0.69-1.18	0.451
Tbi(mean, μ mol/L)	1.010	1.01-1.02	<0.001	1.000	0.99-1.02	0.589
Alb(mean, g/L)	0.930	0.91-0.96	<0.001	0.950	0.93-0.97	<0.001
ALT(mean, U/L)	1.000	1-1.01	0.071	1.000	1-1.01	0.049
AST(mean, U/L)	1.000	1-1.01	0.001	1.000	1-1.01	0.003
GGT(mean, U/L)	1.000	1-1.00	<0.001	1.000	1-1.00	<0.001
ALP(mean, U/L)	1.010	1-1.01	<0.001	1.000	1-1.01	<0.001
AFP(mean, ng/ml)	1.000	1-1.00	0.002	1.000	1-1.00	0.063
HBsAg(Positive/Negative)(%)	0.790	0.57-1.1	0.169	1.060	0.79-1.42	0.717
HBV_DNA(\geq 2000/ $<$ 2000 IU/ml)(%)	1.160	0.91-1.48	0.222	1.310	1.08-1.6	0.007
Type of resection (Nonanatomical/anatomical)(%)	1.270	0.99-1.62	0.059	1.080	0.88-1.31	0.477
Surgical margin ($<$ 1/ \geq 1cm)(%)	0.930	0.73-1.19	0.571	1.010	0.82-1.23	0.953
Hilar clamping time (mean, minutes)	1.000	0.99-1.02	0.674	1.010	0.99-1.02	0.263
Tumor size(mean, cm)	1.130	1.09-1.17	<0.001	1.090	1.06-1.13	<0.001
Tumor Number ($>$ 1/1)(%)	1.650	1.15-2.38	0.007	1.600	1.16-2.22	0.004
Satellite nodules (presence/absence)(%)	1.650	1.15-2.38	0.007	1.600	1.16-2.22	0.004
Cirrhosis(Yes/No)(%)	1.710	1.3-2.25	<0.001	1.490	1.2-1.84	<0.001
Edmondson-Steiner grade III-IV/I-II(%)	2.690	1.99-3.62	<0.001	1.650	1.33-2.06	<0.001
MVI (Yes/No)(%)	1.690	1.19-2.38	0.003	1.730	1.29-2.32	<0.001
Multivariate analysis						
Tbi(mean, μ mol/L)	1.010	1-1.01	0.001			
Alb(mean, g/L)	0.960	0.93-1	0.032			
Tumor size(mean, cm)	1.160	1.11-1.21	<0.001	1.100	1.06-1.14	<0.001
Tumor Number ($>$ 1/1)(%)	1.750	1.2-2.55	0.004	1.530	1.09-2.14	0.014
Cirrhosis(Yes/No)(%)	1.860	1.39-2.5	<0.001	1.430	1.14-1.79	0.002
Edmondson-Steiner grade III-IV/I-II(%)	2.630	1.94-3.56	<0.001	1.640	1.31-2.05	<0.001

Bold values indicate statistical significance ($P < 0.05$).

HCC, hepatocellular carcinoma; Tbi, total bilirubin; Alb, albumin; ALT, alanine transaminase; AST, aspartate aminotransferase; GGT, γ -glutamyl transferase; ALP, alkaline phosphatase; AFP indicates α -fetoprotein; MVI, microvascular invasion; BCLC, Barcelona Clinic Liver Cancer; OS, overall survival; RFS, recurrence-free survival; CI, confidence interval; HR, hazard ratio.

Supplementary Table 5. Comparison of clinicopathological characteristics between intermediate group and matched male patients with HCC after PSM.

Features	Male (n=192)	Female (n=96)	P-value
Age (mean, Years)	48.94 (2.81)	48.95(2.91)	0.977
Cigarette smoking (Yes/No)(%)	29(15.1)/163 (84.9)	2(2.1)/94(97.9)	0.002
Alcohol consumption (Yes/No)(%)	41(21.4)/151(78.6)	0(0.0)/96(100.0)	<0.001
Diabetes mellitus (Yes/No)(%)	7(3.6)/185(96.4)	9(9.4)/87(90.6)	0.084
Antiviral (Yes/No)(%)	41(21.4)/151(78.6)	24(25.0)/72(75.0)	0.584
Tbi(mean, μ mol/L)	14.17(7.84)	13.71(5.79)	0.612
Alb(mean, g/L)	40.94(4.03)	41.43(4.01)	0.324
ALT(mean, U/L)	43.25(34.74)	39.97(38.13)	0.466
AST(mean, U/L)	38.95(25.08)	39.66(25.43)	0.821
GGT(mean, U/L)	95.64(93.17)	82.39(103.12)	0.273
ALP(mean, U/L)	91.48(40.20)	91.98(41.06)	0.922
AFP(mean, ng/ml)	424.21(946.56)	609.74(1438.05)	0.192
HBsAg(Positive/Negative)(%)	167(87.0)/25(13.0)	85(88.5)/11(11.5)	0.850
HBVDNA(\geq 2000/ $<$ 2000 IU/ml)(%)	85(44.3)/107(55.7)	45(46.9)/51(53.1)	0.769
Type of resection (Nonanatomical/anatomical)(%)	103(53.6)/89(46.4)	56(58.3)/40(41.7)	0.530
Surgical margin ($<$ 1/ \geq 1cm)(%)	80 (41.7) / 112(58.3)	56(58.3)/40(41.7)	0.705
Hilar clamping time (mean, minites)	16.71(10.06)	14.88(10.16)	0.147
Tumor size(mean, cm)	5.60(3.76)	4.66(3.15)	0.036
Tumor Number ($>$ 1/1)(%)	14(7.3)/178(92.7)	4(4.2)/92 (95.8)	0.439
Satellite nodules (presence/absence)(%)	15(7.8)/177(92.2)	4(4.2)/92(95.8)	0.356
Cirrhosis(Yes/No)(%)	128(66.7)/64(33.3)	56(58.3)/40(41.7)	0.208
Edmondson-Steiner grade III-IV/I-II(%)	138(71.9)/54(28.1)	65(67.7)/31(32.3)	0.553
MVI (Yes/No)(%)	14(7.3)/178(92.7)	2(2.1)/94(97.9)	0.122
BCLC stage (A-B/0)(%)	190(99.0)/2(1.0)	88(91.7)/8(8.3)	0.004

Bold values indicate statistical significance ($P < 0.05$). P values male versus female cohort.

HCC, hepatocellular carcinoma; Tbi, total bilirubin; Alb, albumin; ALT, alanine transaminase; AST, aspartate aminotransferase; GGT, γ -glutamyl transferase; ALP, alkaline phosphatase; AFP indicates α -fetoprotein; MVI, microvascular invasion; BCLC, Barcelona Clinic Liver Cancer.

Supplementary Table 6. Univariate and multivariate analysis of OS and RFS in the intermediate group matched male patients with HCC after PSM.

Features	OS			RFS		
	HR	95%CI	P-value	HR	95%CI	P-value
Univariate analysis						
Sex	0.750	0.48-1.15	0.187	0.790	0.56-1.12	0.188
Age (mean, Years)	0.960	0.9-1.03	0.248	1.010	0.95-1.07	0.825
Cigarette smoking (Yes/No)(%)	1.200	0.66-2.2	0.551	0.950	0.57-1.61	0.862
Alcohol consumption (Yes/No)(%)	1.300	0.77-2.19	0.323	1.060	0.68-1.66	0.785
Diabetes mellitus (Yes/No)(%)	0.290	0.07-1.17	0.082	1.080	0.55-2.13	0.813
Antiviral (Yes/No)(%)	0.650	0.39-1.1	0.109	0.770	0.52-1.15	0.203
Tbi(mean, μ mol/L)	1.010	1-1.03	0.103	1.010	0.98-1.03	0.554
Alb(mean, g/L)	0.950	0.9-1	0.039	0.960	0.92-1	0.033
ALT(mean, U/L)	1.010	1-1.01	<0.001	1.000	1-1.01	0.026
AST(mean, U/L)	1.010	1.01-1.02	<0.001	1.010	1.01-1.02	<0.001
GGT(mean, U/L)	1.000	1-1.01	<0.001	1.000	1-1.00	0.005
ALP(mean, U/L)	1.010	1-1.01	<0.001	1.010	1-1.01	<0.001
AFP(mean, ng/ml)	1.000	1-1.00	0.432	1.000	1-1.00	0.179
HBsAg(Positive/Negative)(%)	1.450	0.75-2.79	0.264	1.280	0.78-2.1	0.330
HBVDNA(\geq 2000/ $<$ 2000 IU/ml)(%)	1.680	1.13-2.49	0.010	1.360	0.99-1.87	0.060
Type of resection (Nonanatomical/anatomical)(%)	1.380	0.92-2.06	0.116	1.200	0.87-1.66	0.273
Surgical margin ($<$ 1/ \geq 1cm)(%)	0.780	0.53-1.17	0.235	1.210	0.88-1.68	0.236
Hilar clamping time (mean, minutes)	1.020	1-1.03	0.066	1.020	1-1.03	0.042
Tumor size(mean, cm)	1.120	1.07-1.16	<0.001	1.090	1.05-1.14	<0.001
Tumor Number ($>$ 1/1)(%)	2.360	1.23-4.55	0.010	2.030	1.14-3.59	0.015
Satellite nodules (presence/absence)(%)	2.110	1.1-4.06	0.025	1.940	1.12-3.38	0.018
Cirrhosis(Yes/No)(%)	0.930	0.62-1.39	0.725	0.990	0.71-1.39	0.970
Edmondson-Steiner grade III-IV/I-II(%)	3.610	2.01-6.46	<0.001	1.510	1.05-2.16	0.025
MVI (Yes/No)(%)	2.570	1.37-4.82	0.003	1.170	0.57-2.38	0.674
Multivariate analysis						
AST(mean, U/L)				1.010	1-1.02	0.020
GGT(mean, U/L)	1.000	1-1.01	0.008			
Edmondson-Steiner grade III-IV/I-II(%)	2.530	1.38-4.62	0.003			
Tumor size(mean, cm)	1.100	1.04-1.16	<0.001	1.060	1.01-1.11	0.016

Bold values indicate statistical significance ($P < 0.05$).

HCC, hepatocellular carcinoma; Tbi, total bilirubin; Alb, albumin; ALT, alanine transaminase; AST, aspartate aminotransferase; GGT, γ -glutamyl transferase; ALP, alkaline phosphatase; AFP indicates α -fetoprotein; MVI, microvascular invasion; BCLC, Barcelona Clinic Liver Cancer; OS, overall survival; RFS, recurrence-free survival; CI, confidence interval; HR, hazard ratio.